RoHS Compliant
Directive 2002/95/EC

Progressive scan CCD color camera
KP-FD140PCL/SCL
Specifications

1. General

The KP-FD140CL/PCL is single CCD type RGB color camera which utilized the progressive scan CCD image sensor with square pixel for SXGA format of 1/2-inch which adopted the RGB primary color mosaic filter.

The image of 1360 (H) x 1024 (V) is output in RGB at 30 frames per second.

The square lattice pixel format also provides excellent suitability for image processing applications.

2. Outstanding features

(1) High resolution and high color fidelity

The 1/2-inch 1,450,000 pixels square lattice progressive scan CCD and the RGB primary color mosaic filter achieve a high resolution and high color fidelity of 1360(H) x 1024(V) (SXGA)

(2) Small sized camera

The camera has small SDR connector for digital outputs.

Therefore, the camera has the realization of small-sized shape of 44 (W) x 44 (H) x 41 (D) mm.

(3) Remote control

- Multi-step electronic shutter (from 1/30 to 1/50000 second in 8 steps)
- Variable shutter (from 10 to 1/100000 second)
- Frame on demand (the image capture at desired timing using the external trigger signal input)
- White balance (ATW, Manual and One-push)
- 6 vector independent masking (R, G, B, Cy, Mg, Ye can be independently varied)

and other various functions are set by remote control via CameraLink cable.

(4) Power over CameraLink

Power supply of KP-FD140PCL is input via CameraLink cable.

* Power supply of KP-FD140SCL is input from DCIN/SYNC connector.

SYMBOL	DATE	DESCRIPTION	(DRAWN)	DESIGNED
-	Sep.14,2007	(first edition)	N.Abe	T.Ohsawa

MODEL KP-FD140PCL/SCL		TOLERANCE	Prod. Code - Order No.	
DESIGNED DATE	APPROVED DATE	UNIT	TITLE KP-FD140PCL/SCL Specifications	REV. 0
CHECKED DATE	STORED DATE	SCALE		
Hitachi Kokusai Electric			DWG. No. E400029792	SHEET 1/18

3. Specifications

(1) Imaging device	1/2-inch progressive scan interline CCD
Total pixels	1434 (H) x 1050 (V)
Effective pixels	1392 (H) x 1040 (V)
Pixel size	4.65 um (H) x 4.65 um (V) (square lattice)
Color filter	RGB primary color mosaic filter
(2) Sensing area	6.32 mm (H) x 4.76 mm (V)
(3) Scanning system	Progressive
(4) Aspect ratio	4 : 3
(5) Frame rate	30 frames per second (full pixel readout)
(6) Horizontal drive frequency	57.6000 MHz
(7) Horizontal scanning frequency	32.179 kHz
(8) Vertical scanning frequency	30.13 Hz
(9) Sync system	Internal
(10) Lens mount	C mount
(11) Flange focal distance	17.526 mm
(12) Video output	
Interface	CameraLink 57.6000 MHz
Protocol	Base configuration (1ch: SDR connector x 1pc.)
	Medium configuration (2ch: SDR connector x 2pcs)
Output format	(a) 24bits (R:8bit G:8bit B:8bit) (Base configuration)
	(b) 30bits (R:10bit G:10bit B:10bit) (Medium configuration)
	(c) 36bits (R:12bit G:12bit B:12bit) (Medium configuration)
Output image size	1360(H) x 1024(V) (full pixel readout)
(13) Sensitivity	2000 lx, F5.6, 3200 K
(14) Minimum lamination	10 lx (F1.4, MAX GAIN)
(15) Signal noise to ratio	48 dB
(16) Electric shutter	OFF, 1/30, 1/60, 1/100, 1/250, 1/1000,
	1/2000, 1/10000, 1/50000 second.
	OFF is normal exposure (frame rate)
	or changeable by variable shutter
	(from 10 to 1/100000 second)
(17) Frame on demand	
Mode	(A) Fixed shutter mode (8 steps or variable)
	(B) ONE trigger mode
	(C) VD reset mode
Trigger input	CameraLink (CC1) or DCIN/SYNC connector

(18) Partial scan	Selectable start position and width of picture grabbing in 1H step.
(19) ALC (Auto level control)	
Mode	(A) AGC (Auto gain control) (B) AES (Auto electric shutter) (C) AGC & AES
Video level	Adjustable
(20) Gain	Auto/Manual (0 to +18dB) (Approx. 0.0358dB step)
(21) White balance	ATW / MANUAL / One-push
(22) Gamma	OFF (γ =1) / LUT
(23) Color masking	OFF / ON (6 vector independent masking)
(24) Paint black	Adjustable
(25) Sharpness	Adjustable
(26) Brightness	Adjustable
(27) Knee	Adjustable
(28) Power supply voltage	12 ± 1 VDC
(29) Current consumption	Approx. 300 mA (Approx. 3.6W)
(30) Ambient	
Performance	0 to + 40℃ (+32 to +104 F), less than 90 % RH
Operation	-10 to + 50℃ (+14 to +122 F), less than 90 % RH
Storage	-20 to + 60℃ (-4 to +140 F), less than 70 % RH (without dew condensation)
(31) Vibration endurance	10 to 55Hz (2.37 to 71.7 m/s^2), sweep: 1minute, XYZ,30 min
(32) Shock endurance	490.3 m/s^2 (Drop test, once each top, bottom, left and right)
(33) External dimensions	44 (W) x 44 (H) x 41 (D) mm (not including mount protrusions)
(34) Mass	Approx. 110 g

(35) Remote control

(a) Signal system

1. Control system	Start-stop synchronization system
2. Transmission rate	9600 bps
3. Data length	8 bits
4. Start bit	1bit
5. Stop bit	1bit
6. Parity	None
7. Bit transfer	LSB first

(b) Communications control system

Full control by remote control software, data send/receive by text data transfer to camera microprocessor (BSC system handshake)

(c) Control items

1. Shutter speed	OFF, 1/30, 1/60, 1/100, 1/250, 1/1000, 1/2000, 1/10000, 1/50000 second Factory setting: OFF
2. Variable shutter	Minimum 1/100000 second, Max 10 second
3. Trigger Mode	OFF, Fixed shutter, One trigger and VD reset mode Factory setting: OFF
4. Gain	0 to 18dB(Approx. 0.0358 dB step) Factory setting: 0 dB
5. ALC	
6. White balance	
7. Gamma	
8. 6 color independent masking	
9. Paint black	
10. Sharpness	
11. Brightness	
12. Knee	
13. Partial scan	Factory setting: OFF
14. VD / FVAL	Factory setting: FVAL
15. HD / LVAL	Factory setting: LVAL
16. 24bit / 30bit / 36bit	Factory setting: 24bit
17. Trigger pulse polarity	POS or NEG Factory setting: POS
18. Trigger input	CameraLink (CC1) or DCIN/SYNC connector Factory setting: CC1
19. Output signal	OFF, FLASH OUT and VD OUT Factory setting: OFF

4. Composition

(1) Camera (with IR cut filter)

(2) CD-ROM (Operation manual, control software)

(3) Composition table

5. Optional accessories

(1) Dummy glass (AR coated)	ARC1214
(2) IR cut filter	IRC650
(3) Junction box	JU-F30
(4) Tripod adaptor	TA-F500
(5) 12 pin plug	HR10A-10P-12S(01) or equivalent

(6) Camera cable

	Molded type	Shield type
2 m	C-201KSM	C-201KSS
5 m	C-501KSM	C-501KSS
10 m	C-102KSM	C-102KSS

In the CE Marking region, use the shield type and install clamp filter (ZCAT2035-0930A: TDK) at both ends of the cable.

(7) Digital out cable

- Mini CameraLink cable (for KP-FD140SCL) SDR-MDR type

Cable length	Model name
1m	C-101SCL
2m	C-201SCL
3m	C-301SCL
5m	C-501SCL
10m (for High frequency)	C-102SCL (HF)

- PoCL cable (for KP-FD140PCL)

Cable length	Model name	
	SDR-SDR type	SDR-MDR type
1m	C-101PCL (SS)	C-101PCL (SM)
2m	C-201PCL (SS)	C-201PCL (SM)
3m	C-301PCL (SS)	C-301PCL (SM)
5m	C-501PCL (SS)	C-501PCL (SM)

SDR: Shrunk Delta Ribbon
MDR: Miniature Delta Ribbon

6. Signal connection to connector

(1) Signal connection to DCIN/SYNC connector

PIN No.	Internal SYNC mode	PIN No.	Internal SYNC mode
1	GND	7	Trigger IN / VD IN
2	---- (KP-FD140PCL) +12V (KP-FD140SCL)	8	GND
3	GND	9	----
4	----	10	FLASH OUT / VD OUT
5	GND	11	----
6	----	12	GND

Plug (matching cable plug) Hirose HR10A-10P-12S(01) or equivalent

(Note) Please do not unplug and insert cable (camera cable) with a power supplied to a camera. Install clamp filter (ZCAT 2035-0930A: TDK) at both ends (camera and video processor ends) in the CE marking region.

(2) Signal connection to DIGITAL OUT connector

(a) Interrelation between Number of DATA bits and Number of used connector

	Number of DATA bits	connector 1	connector 2
1	24bit (R:8bit G:8bit B:8bit)	O	-
2	30bit (R:10bit G:10bit B:8bit)	O	O
3	36bit (R:12bit G:12bit B:12bit)	O	O

O: Use
-: Not use

(b) Signal connection to DIGITAL OUT connector

D.OUT1 (24bit / 30bit / 36bit)

Pin No.	Signal	Pin No.	Signal
1	+12V (KP-FD140PCL) GND (KP-FD140SCL)	14	GND
2	TXOUT 0 (−)	15	TXOUT 0 (+)
3	TXOUT 1 (−)	16	TXOUT 1 (+)
4	TXOUT 2 (−)	17	TXOUT 2 (+)
5	TXCLKOUT (−)	18	TXCLKOUT (+)
6	TXOUT 3 (−)	19	TXOUT 3 (+)
7	RX (+) [SERTC (+)]	20	RX (−) [SERTC (−)]
8	TX (−) [SERTFG (−)]	21	TX (+) [SERTFG (+)]
9	TRIG/VD (−) [CC1 (−)]	22	TRIG/VD (+) [CC1 (+)]
10	N.U. [CC2 (+)]	23	N.U. [CC2 (−)]
11	N.U. [CC3 (−)]	24	N.U. [CC3 (+)]
12	N.U. [CC4 (+)]	25	N.U. [CC4 (−)]
13	GND	26	+12V (KP-FD140PCL) GND (KP-FD140SCL)

D.OUT2 (30bit / 36bit)

Pin No.	Signal	Pin No.	Signal
1	+12V (KP-FD140PCL) GND (KP-FD140SCL)	14	GND
2	TYOUT 0 (−)	15	TYOUT 0 (+)
3	TYOUT 1 (−)	16	TYOUT 1 (+)
4	TYOUT 2 (−)	17	TYOUT 2 (+)
5	TYCLKOUT (−)	18	TYCLKOUT (+)
6	TYOUT 3 (−)	19	TYOUT 3 (+)
7	N.U.	20	N.U.
8	N.U.	21	N.U.
9	N.U.	22	N.U.
10	N.U.	23	N.U.
11	N.U.	24	N.U.
12	N.U.	25	N.U.
13	GND	26	+12V (KP-FD140PCL) GND (KP-FD140SCL)

Connector (camera side) Sumitomo 3M 1226-1100-00PL or equivalent

N.U.: Not used

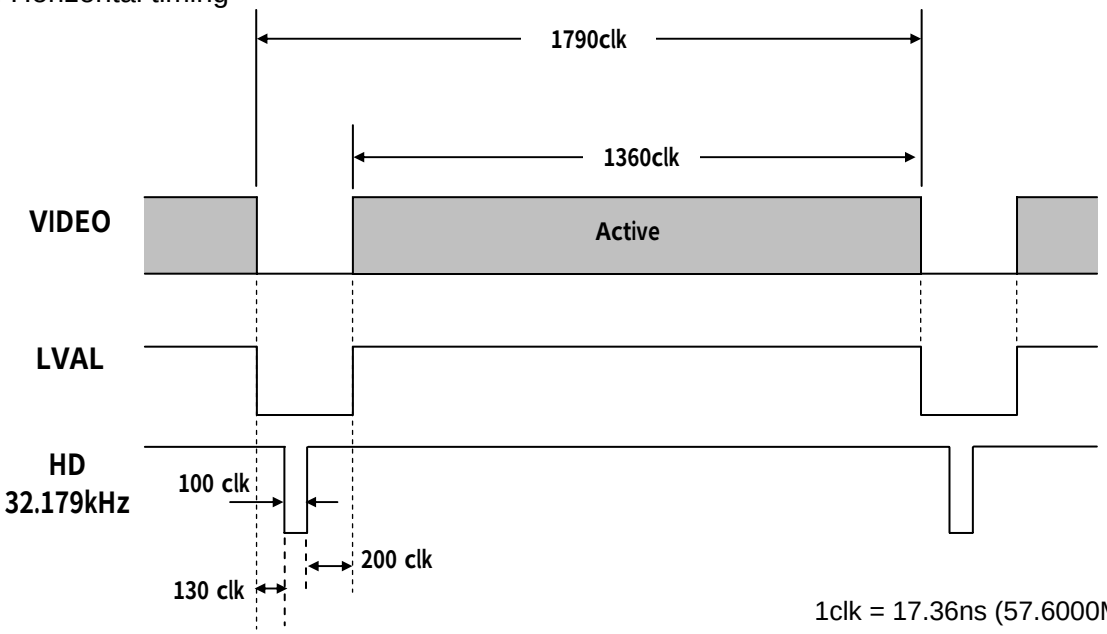
- D.OUT2 is used for Medium configuration.
- The digital out cable should be comprised of a twisted pair of wires having 100 ohm characteristic impedance and an outer sheath shield type conductor.
- Connect the shield (ground) of the digital out cable to the ground terminal of the video equipment, frame grabber, etc.
- Install clamp filter (ZCAT2035-0930A: TDK) at both ends (camera and video processor ends) in the CE marking region.
- Tx: Transmit data from camera to machine
- Rx: Transmit data from machine to camera

(Note)

Please do not unplug and insert cable (digital out cable) with a power supplied to a camera.

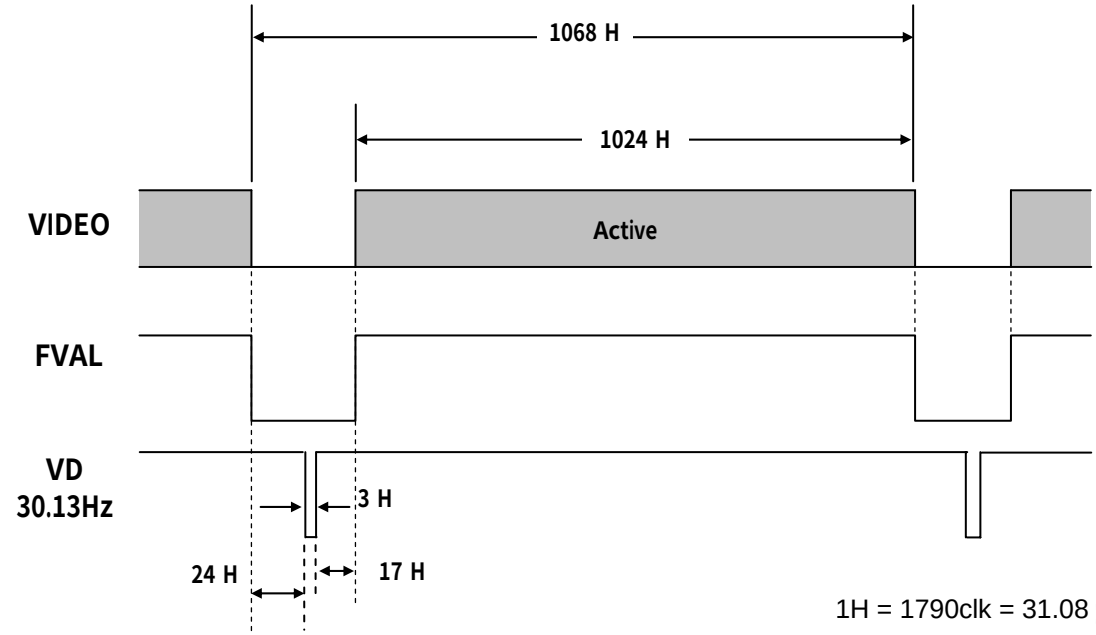
7. CameraLink output

7-1. Horizontal timing



1clk = 17.36ns (57.6000MHz)

7-2. Vertical timing

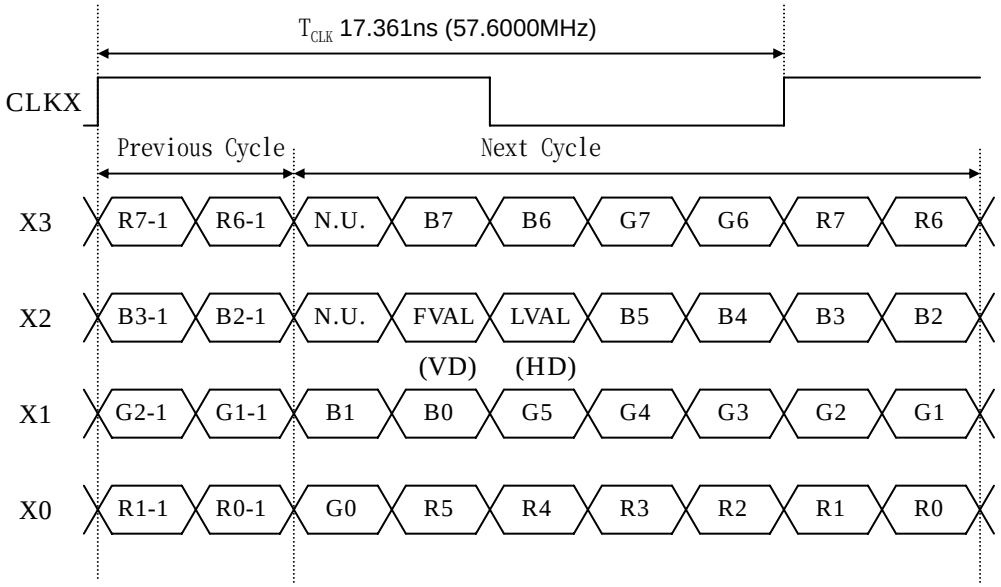


1H = 1790clk = 31.08 μs

7-3. Transmitter LVDS output pulse position measurement

(1) Base configuration 24bit

D.OUT 1

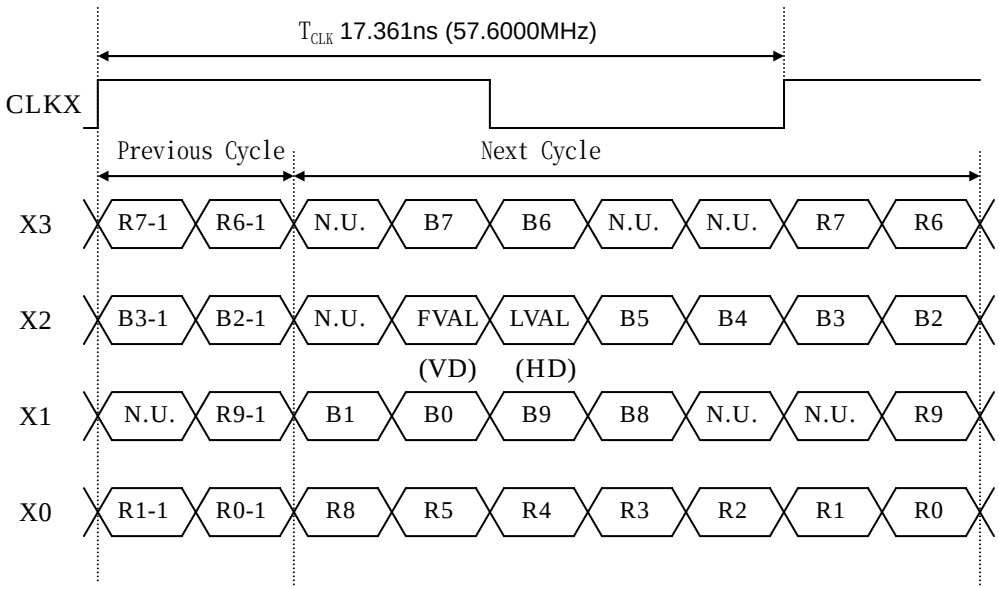


N.U.: Not used

When using at base configuration, please be sure to connect CameraLink cable to D.OUT1.
If the cable is connected to D.OUT2, machine may break down.

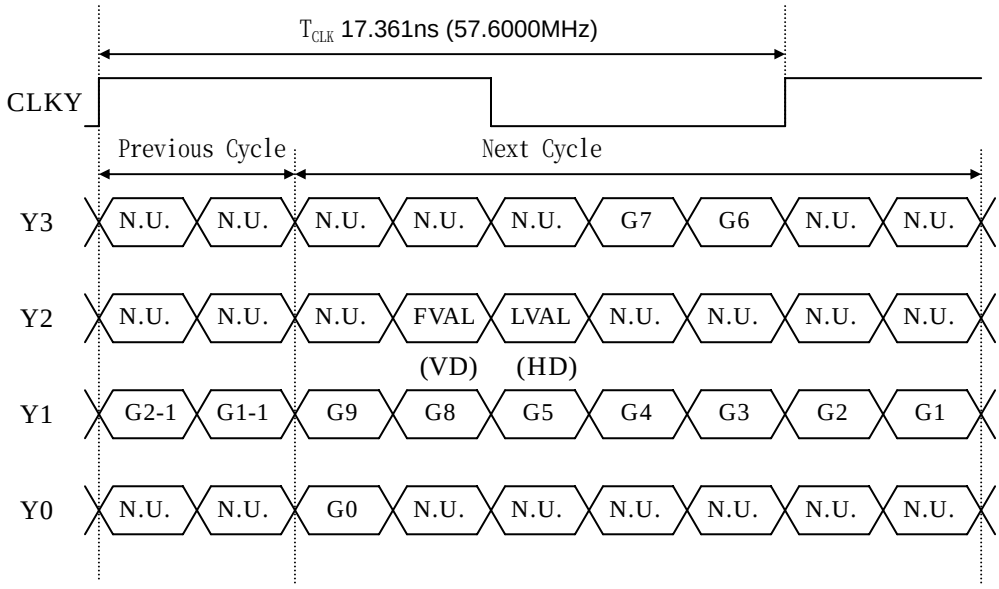
(2) Medium configuration 30bit

D.OUT 1



N.U.: Not used

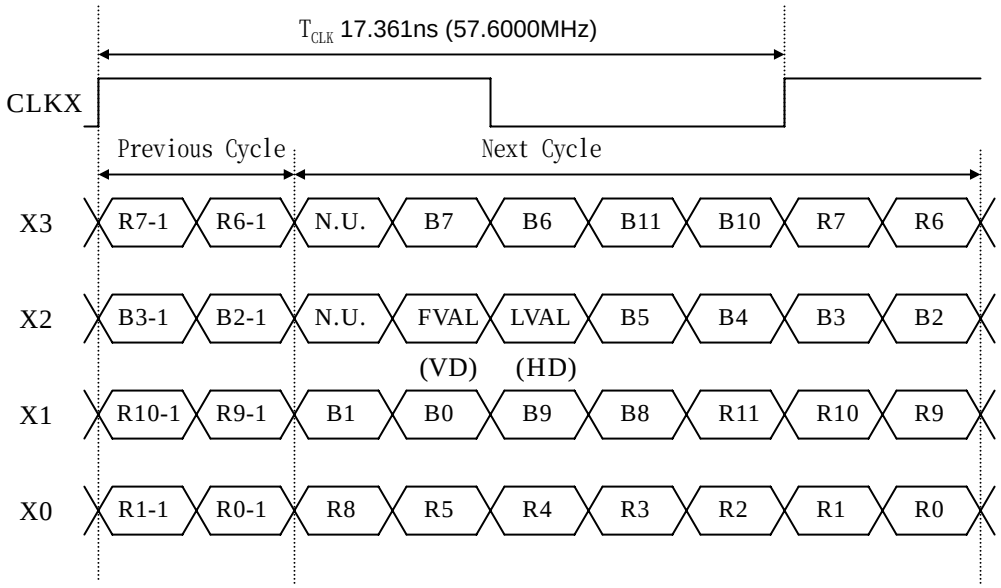
D.OUT 2



N.U.: Not used

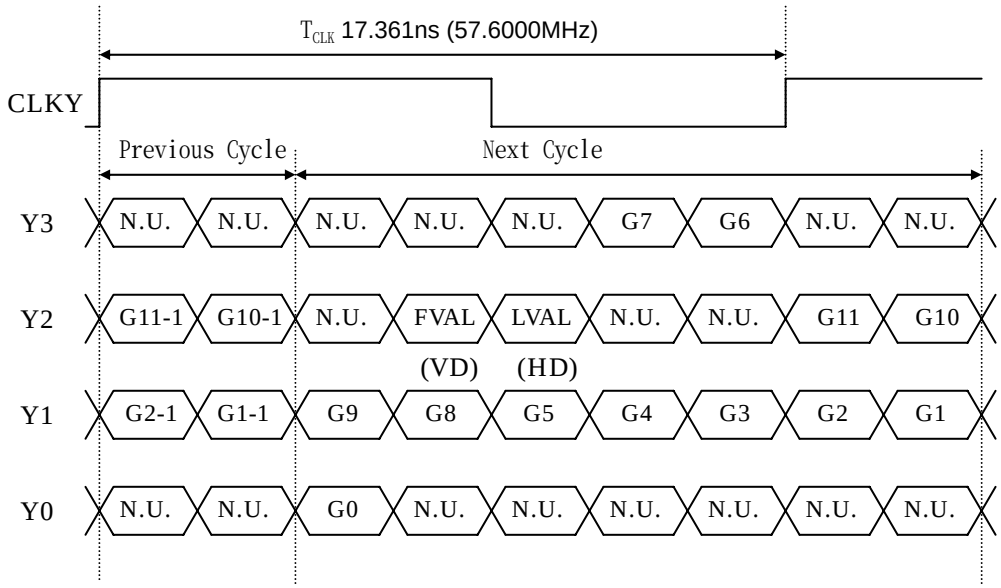
(3) Medium configuration 36bit

D.OUT 1



N.U.: Not used

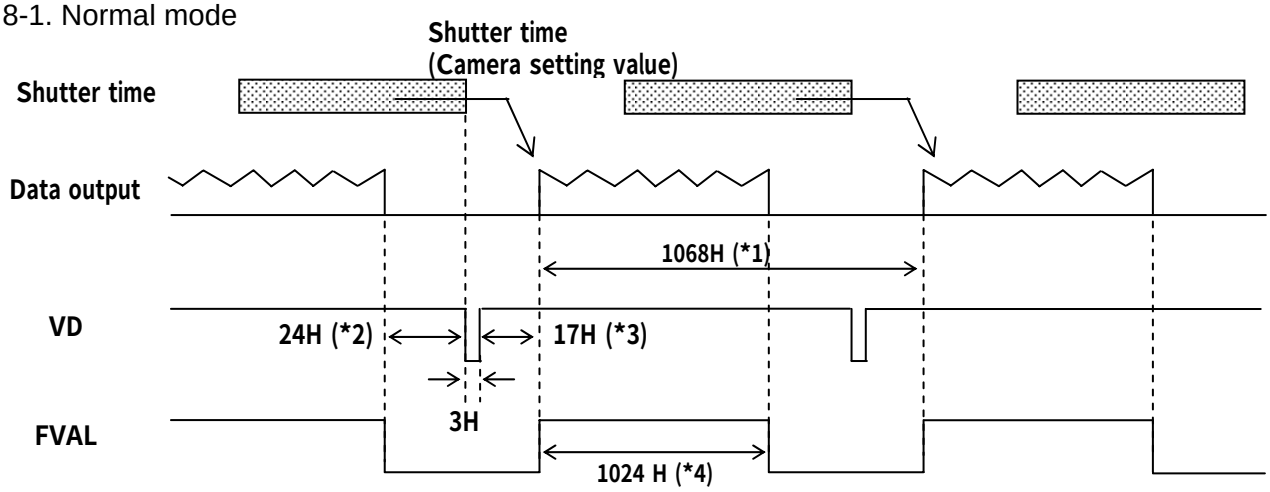
D.OUT 2



N.U.: Not used

8. Timing chart

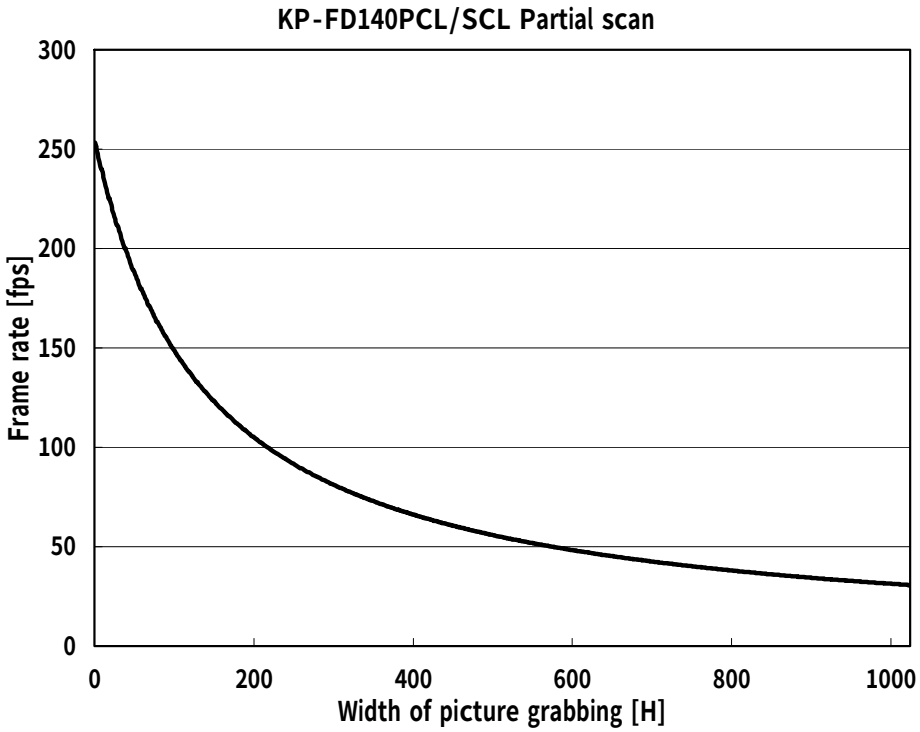
8-1. Normal mode



1H = 1790clk = 31.08 μs

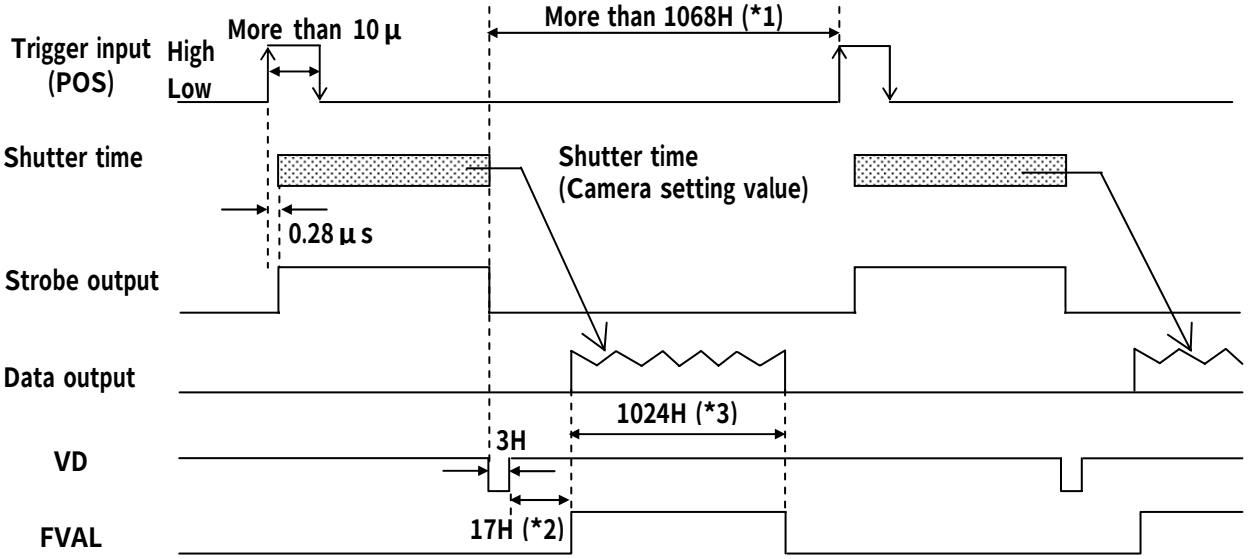
When partial scan is ON, *1 to *4 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).
***1: (22 + Width + (1048 - Width) / 10)H**
***2: (2 + (1048 - Width) / 10 - Start / 10)H**
***3: (17 + Start / 10)H**
***4: (Width)H**
Note1: Please use the partial scan in following condition.
Start + Width ≦ 1025
Note2: Please use FVAL in the partial scan.

Graph following shows frame rate in each of picture gabbing in the partial scan mode.



Note: Frame rate can be calculated from following equations using width of picture grabbing.
Lines = 22 + Width + (1048 - Width) / 10
Frame rate = (57600000 / 1790) / Lines

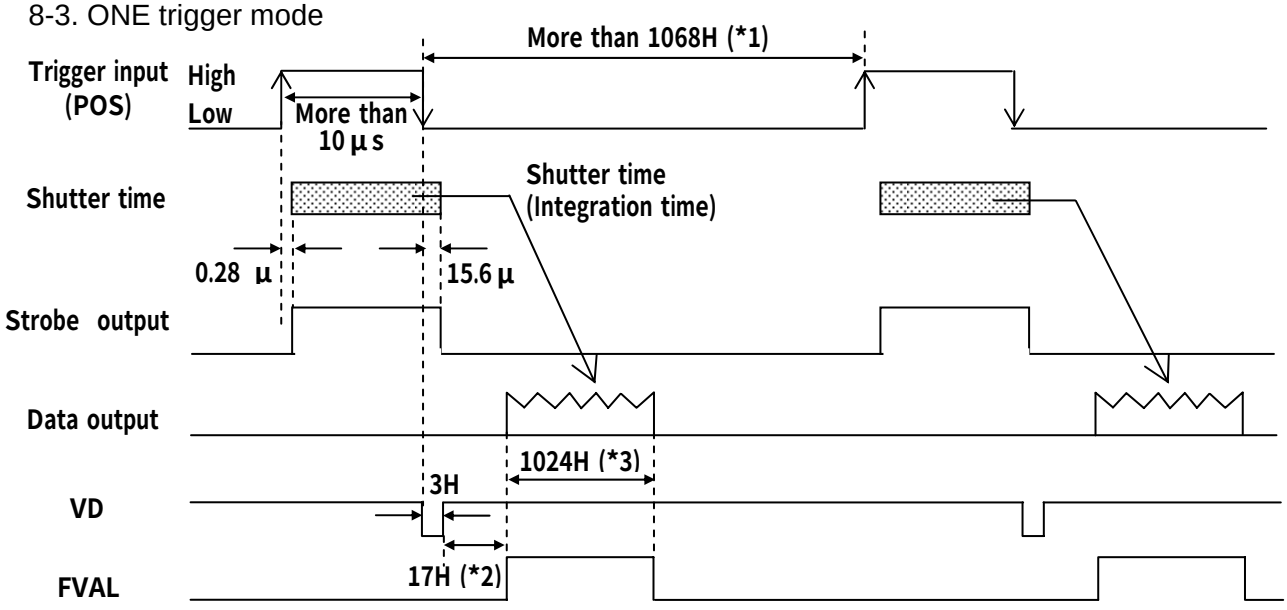
8-2. Fixed shutter



1H = 1790clk = 31.08 µ s

When partial scan is ON, *1 to *3 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).
*1: (22 + Width + (1048 - Width) / 10)H or more
*2: (17 + Start / 10)H
*3: (Width)H
Note1: Please use the partial scan in following condition.
Start + Width ≦ 1025
Note2: Please use FVAL in the partial scan.

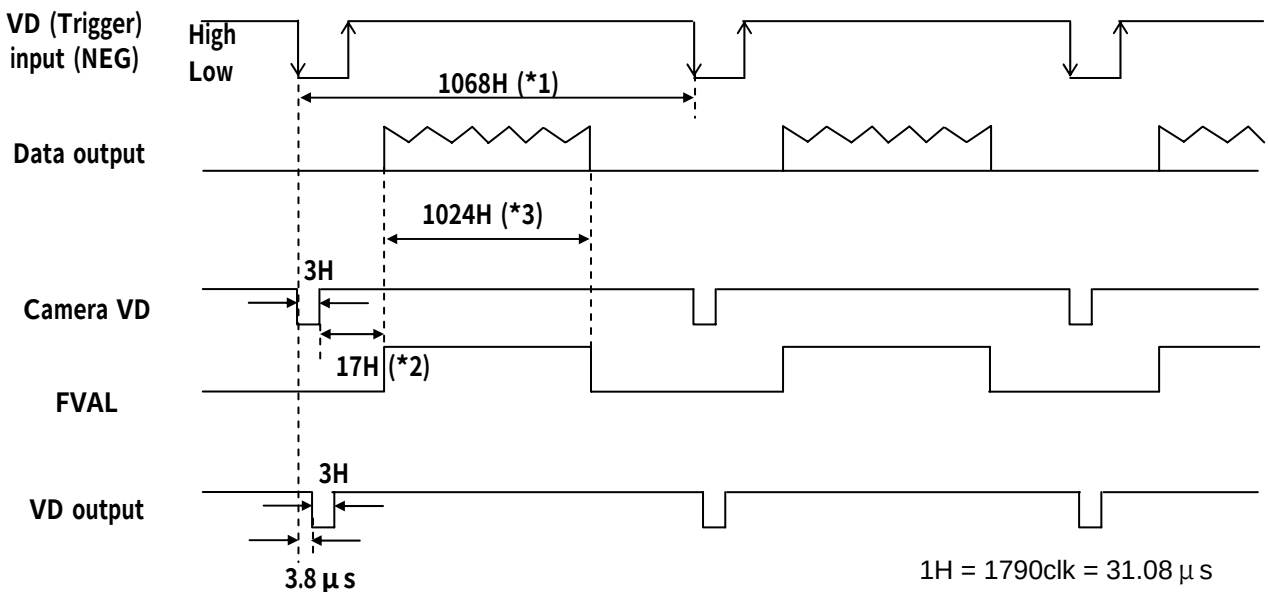
8-3. ONE trigger mode



1H = 1790clk = 31.08 µ s

When partial scan is ON, *1 to *3 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).
*1: (22 + Width + (1048 - Width) / 10)H or more
*2: (17 + Start / 10)H
*3: (Width)H
Note1: Please use the partial scan in following condition.
Start + Width ≦ 1025
Note2: Please use FVAL in the partial scan.

8-4. VD reset mode



When partial scan is ON, *1 to *3 are variable by start position of picture grabbing and width of picture grabbing (omit the figures after the decimal fractions).

***1: (22 + Width + (1048 - Width) / 10)H**

***2: (17 + Start / 10)H**

***3: (Width)H**

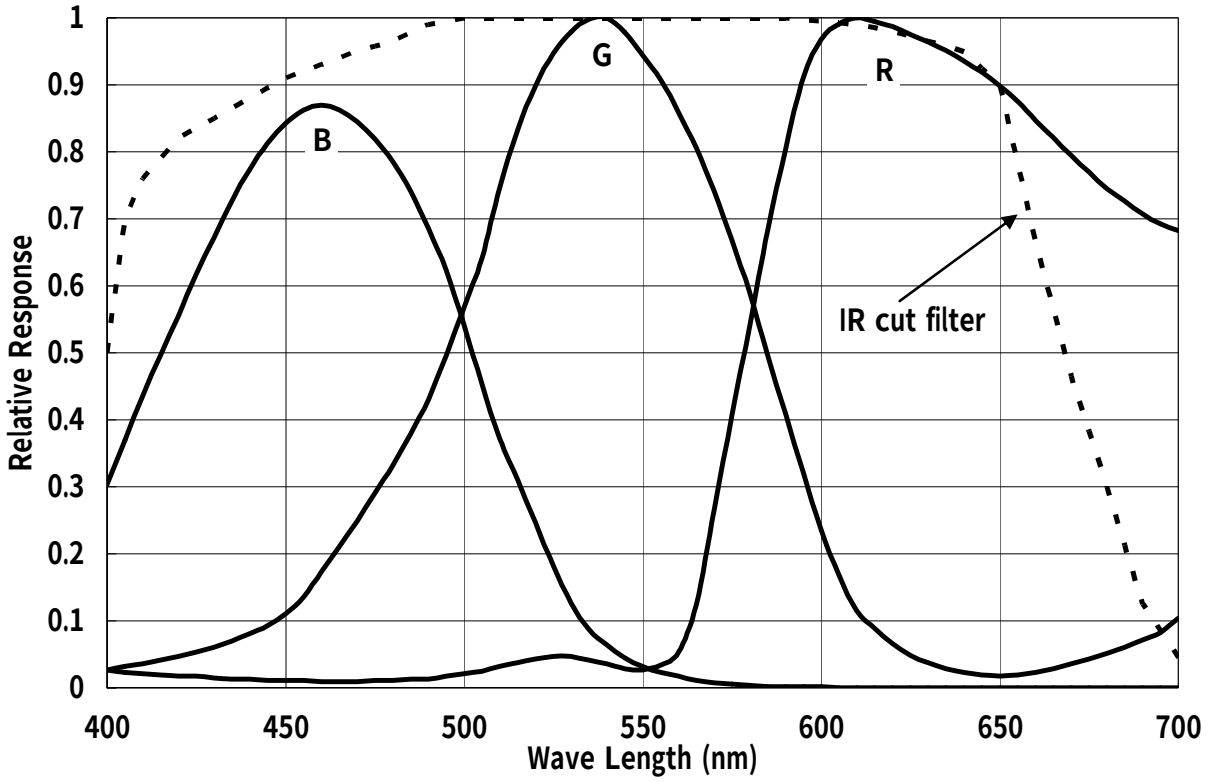
Note1: Please use the partial scan in following condition.

Start + Width ≦ 1025

Note2: Please use FVAL in the partial scan.

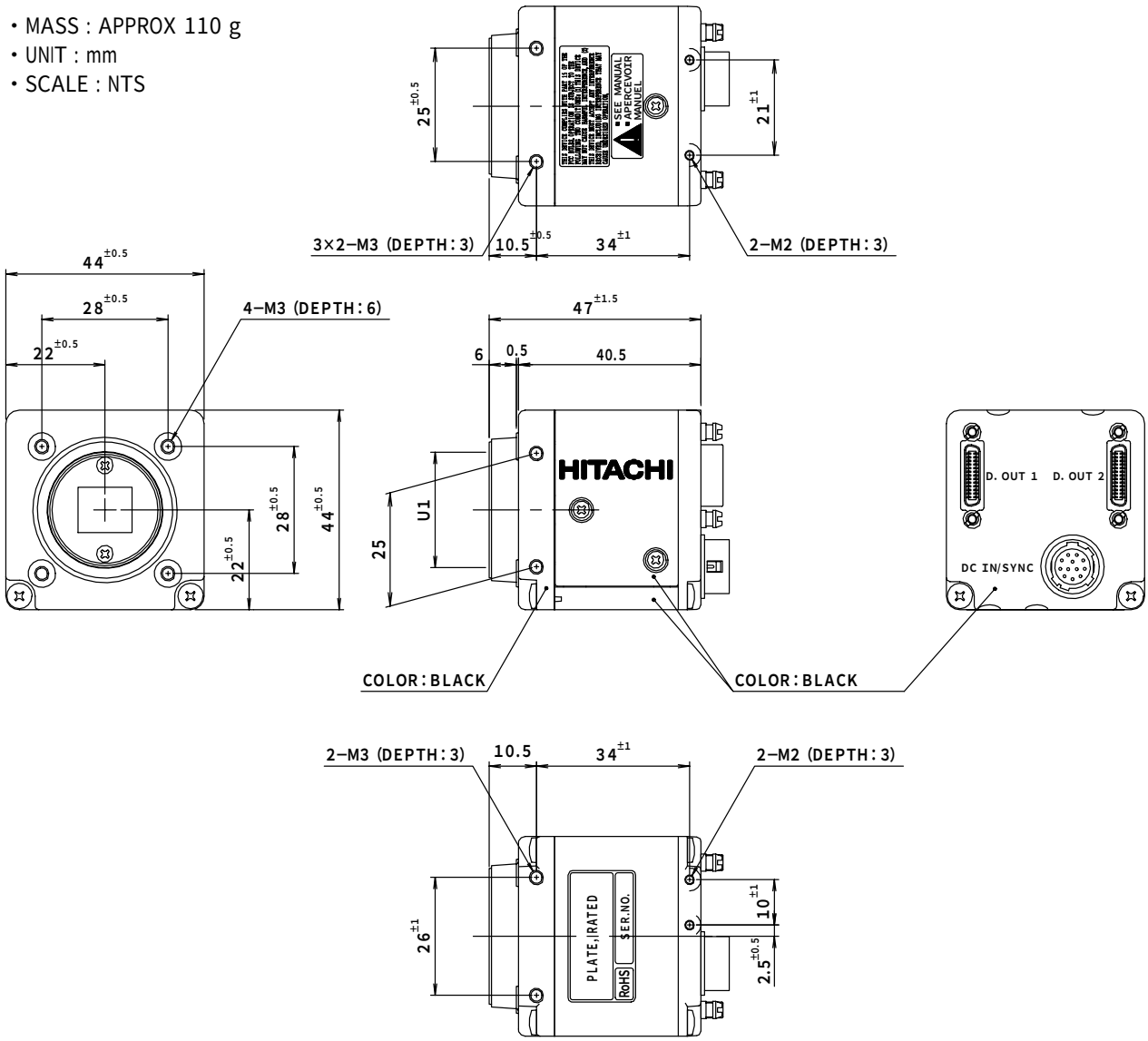
NOTE: If the external VD of cycle which does not match the camera operation mode is input, shutter time has an error.

9. Spectral response



10. External view

- MASS : APPROX 110 g
- UNIT : mm
- SCALE : NTS



DWG. No.	E400029792	SHEET 16/18

Notice:
These specifications are subject to change without prior notice due to product improvement.
Confirm the most recent specifications at time of order.
Hitachi Kokusai certifies this product complies with the standard warranty conditions of Hitachi Kokusai, and that quality control is implemented to the extent required to comply with these conditions.

RoHS Compliant
This product complies with the requirement of the RoHS(Restriction of the use of Certain Hazardous Substances in Electrical and Electronic Equipment) Directive 2002/95/EC

Warranty and service:

(1) The guarantee period is one year after the data purchase.
However, the defects due to erroneous use or intentional act are excluded.
(2) As the defect after expiration of the guarantee period, where product repair is possible, repair will be performed at charge.
(3) The present Warranty pertains only to the camera unit. Secondary malfunctions attributable to camera failure as well as expenses incurred by disassembly and reassembly of the related system, are beyond the scope of this Warranty.
(4) Compensation for loss of business, loss or damage to software, database and other contingent losses are beyond the scope of this Warranty.
(5) Hitachi Kokusai Electric Inc. is not liable for the losses caused when the equipment is used in a system, use for business trades, production process, medical fields, crime prevention applications, etc.
(6) In the case of camera trouble by miss wiring of cable, it will be considered as out of warranty.

Modification history

SIMBLE	DATE	CORRECTION AND REASONS		DESIGNED

DWG. No.	E400029792	SHEET 18/18